

## On the Resemblance of the Young of the Fishes *Platax pinnatus* and *Plectorhynchus chaetodontoides* to Flatworms and Nudibranchs

JOHN E. RANDALL<sup>1</sup> AND ALAN R. EMERY<sup>2</sup>

(Figures 1-4)

Juveniles of the high-bodied ehippid fish *Platax pinnatus* are black with a bright orange border. An individual 16 mm in standard length was observed in Palau to lie on its side and undulate its expanded fins in such a manner that it closely resembled a turbellarian flatworm. The noxious surface secretions of polyclads are believed to make them distasteful to predators; the bright liveries of many of them no doubt serve as warning coloration. In mimicking such a polyclad, a fish probably enjoys relative freedom from predation.

The young of the pomadasid fish *Plectorhynchus chaetodontoides*, which swims with head oriented downward and excessive body and fin movement, and is colored conspicuously and very differently from adults, also bears some resemblance to soft-bodied invertebrates, such as nudibranchs or turbellarians.

WHILE COLLECTING fishes with rotenone at a depth of 15 meters at the base of a coral reef off Malakal Harbor in the Palau Islands, a flat, soft-bodied animal, black with a bright orange border, was observed by the senior author free in the water about two meters off the bottom. Oriented in a horizontal plane, it was swimming slowly with an undulating movement among several small fishes affected by the poison. It was regarded initially as a turbellarian flatworm. On occasions during fish-collecting operations with ichthyocides, benthic turbellarian flatworms may be seen detached from the bottom swimming gracefully but ineffectually, with characteristic marginal body undulations. When taken in dip nets or jars with fishes, flatworms invariably fragment and lose all value as specimens. Thus, no attempt was made to collect this one.

A few minutes later at the same station, the junior author was attracted to a similar "flatworm" (which may have been the same individual), undulating slowly on the bottom. When approached, it fluttered slowly away. Only after several seconds of close observation were the animal's eyes, mouth, and fins noticed, and it was realized that the "flatworm" was a fish. It had a compressed body and had lain on its side; the swimming undulations were carried out

principally by its expansive dorsal and anal fins. The fish was suffering some effects of the rotenone and was easily collected; it died soon after it was placed in a jar with other fishes.

The specimen (figure 1), now deposited in the Bernice P. Bishop Museum, Honolulu, measures 16 mm in standard length. We identify it as the ehippid *Platax pinnatus* (Linnaeus). The fin-ray counts (D V,38; A III,26; P<sub>1</sub> 19) were useful in arriving at the identification. Also important was the reporting by earlier authors (Fowler and Bean, 1929; Weber and de Beaufort, 1936) of larger juveniles of *pinnatus* with a median orange band or broken line on the nape—evidently the last vestige of the peripheral orange band. The 140-mm specimen from Palau illustrated as figure 2 is an example of this intermediate coloration. It had several dots of orange-red medially along its forehead in life.

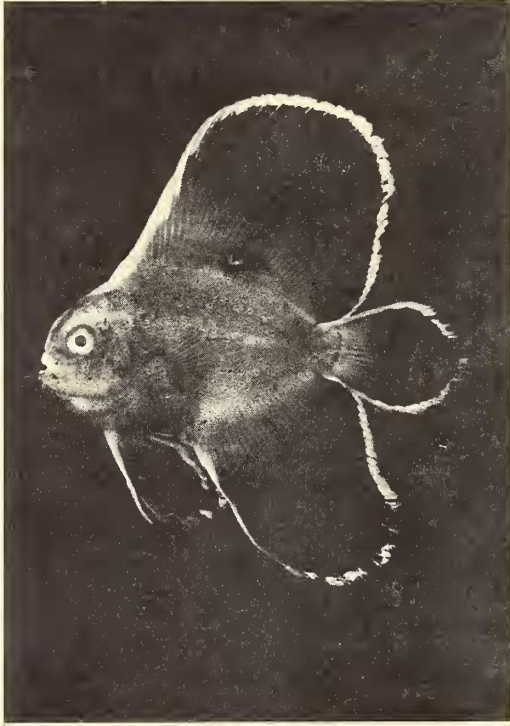
Bleeker (1860) described a 54-mm blackish fish from Ambon as *Platax melanosoma*. It is clear from the illustration of this form in his *Atlas Ichthyologique* (1877, pl. 380, fig. 4) that *melanosoma* is the young of *pinnatus*. The median orange-red band on the head and a partial orange-red border on the dorsal and anal fins are readily seen on the illustration.

Adults of *P. pinnatus* lose all trace of the orange markings. A specimen from Palau, 224 mm in standard length (BPBM 9003), was grayish silver in life with a faint dark bar through the eye and another from the origin of the dorsal fin to the pelvic fins; the dorsal and anal fins

<sup>1</sup> Bernice P. Bishop Museum, Box 6037, Honolulu, Hawaii 96818.

<sup>2</sup> Research Branch, Department of Lands and Forests, Maple, Ontario, Canada.

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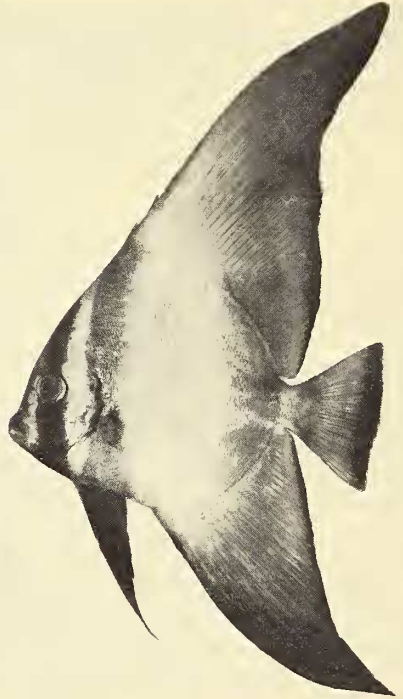


FIGURE 1. *Platax pinnatus*, 16 mm standard length, BPBM 9456, collected in the Palau Islands on April 16, 1970. The pale mark at the base of the dorsal fin surrounded by black is a wound—probably inflicted during collecting. In life the body and fins were entirely black except for the bright orange border.

FIGURE 2. *Platax pinnatus*, 140 mm standard length, BPBM 9530, collected in the Palau Islands on April 12, 1970.

were yellowish; the caudal was yellowish with a broad blackish posterior border; the pectorals were yellow, dusky basally; the pelvics were mainly blackish.

Like other *Platax*, the exceedingly high dorsal and anal fins become relatively shorter with increasing size. *P. pinnatus* is distinctive in developing a concavity in the dorsal profile of the snout as an adult.

Judging from the configuration of the 16-mm mimic, its lack of scales, and small slender canine teeth (tricuspid in larger juveniles and adults), it is not fully transformed from the late postlarval stage.

In its guise as a flatworm, juvenile *Platax pinnatus* may at least partially avoid predation. Turbellaria are seldom eaten by other animals, as their surface secretions appear to be distasteful, if not actually toxic (Hyman, 1951). Many of the polyclads, particularly in warm seas, are strikingly colored. Undoubtedly these bright and contrasting hues serve as warning coloration.

Polyclads often have a brightly colored border, and at least two are known which are dark with a broad orange margin or submarginal zone. One is *Callioplana marginata* (Stimpson) from Japan and the other, *Pseudoceros affinis* (Kelaart), is known from Ceylon to the Hawaiian Islands (Hyman, 1960). The latter has been illustrated in color (Collingwood, 1876; Stummer-Traunfels, 1933).

Some nudibranchs also have similar color patterns. One of the color phases of the Indo-Pacific *Dentrodoris nigra* (Stimpson), for example, is black with a scarlet border (personal communications, E. Alison Kay). Nudibranchs are known to produce noxious secretions, and some make second-hand use of coelenterate nematocysts.

In the genus *Platax*, the habit of resembling some other organism or object of little interest to predators is not restricted to the species *pinnatus*. Juvenile *Platax orbicularis* (Forsskål) [for an illustration, see Taylor, 1964] were observed in the Society Islands to drift on their sides with floating yellowish leaves of *Hibiscus tileaceus* Linnaeus, which they resembled most closely (Randall and Randall, 1960). Other comparable observations have been made (Wiley, 1904; Mortensen, 1917; Uchida, 1951).

The habit of mimicking a flatworm or nudibranch is not unique to *Platax pinnatus*. The young of the pomadasyid fish *Plectorhynchus chaetodontoides* Lacépède (figure 3) was observed in Palau by the senior author to swim in a very unusual manner, with head oriented downward, excessive body flexure, and more flopping of fins than would seem necessary for normal progression. The dorsal and caudal fins

are proportionately longer in the juveniles than adults. The color is orangish brown with large dark-edged white areas—very different from adults which are silvery gray with numerous small black spots (a subadult is illustrated as figure 4). The conspicuous color and mode of swimming of the juvenile *P. chaetodontoides* served to draw attention to itself. Although the fish did not present as convincing a resemblance to a flatworm or nudibranch as *Platax pinnatus*, the first sighting gave the distinct impression of a soft-bodied invertebrate of these groups.

Juveniles of other species of *Plectorhynchus* may also be strikingly colored and swim in a similar peculiar manner. It has been stated that they seem to flutter through the water like the dancing or cavorting of clowns (Herald, 1961). Their movements are decidedly unlike those expected of fishes.

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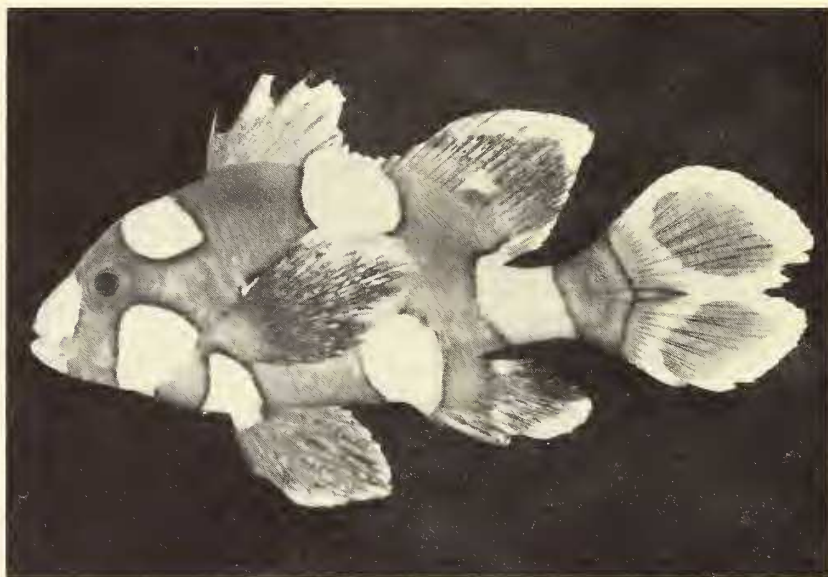


FIGURE 3. *Plectorhynchus chaetodontoides*, 37 mm standard length, BPBM 9240, collected in the Palau Islands on October 5, 1966.

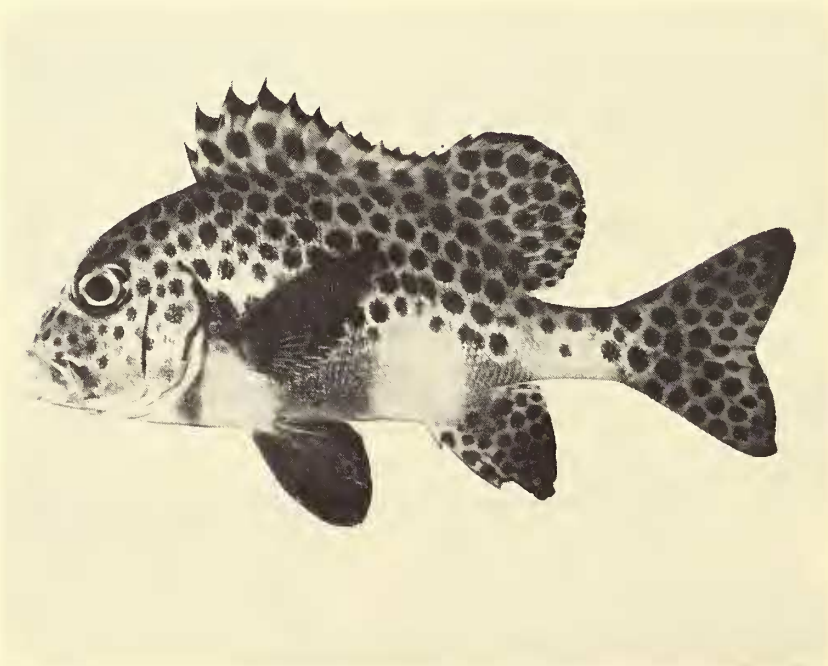


FIGURE 4. *Plectorhynchus chaetodontoides*, 185 mm standard length, BPBM 9480, collected in the Palau Islands on April 15, 1970.

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